

Claims

1. Apparatus for viewing image data, comprising:
(a) display means;
5 (b) network connecting means for transferring frames of said image data over a network from a remotely connected frame source, wherein:

(i) said image data comprises a plurality of image frames and has a frame rate from which may be inferred a due time for display of each frame in a sequence of frames in said image data;

(ii) said frame source returns a frame in response to a frame request issued over said network; and

(c) processing means configured to play a clip by:

(i) displaying selected frames from said frame source, on said display means, at their due time; and

(ii) skipping frames in said frame sequence in response to an indication of the data transfer rate of said network.

2. Apparatus according to claim 1, wherein said indication of the data transfer rate is provided by a comparison of the relative position of an input and an output pointer in a queue of frames that have been selected for display.

3. Apparatus according to claim 1, wherein said frame source includes means for storing pre-rendered image frames.

4. Apparatus according to claim 1, wherein said frames are

skipped in response to a prediction of a network data transfer rate.

5. Apparatus according to claim 1, wherein frames are prefetched into a frame queue prior to their due time.

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6. Apparatus according to claim 1, wherein a frame skip rate is defined by a user.

7. Apparatus according to claim 1, wherein a frame is selected for display by processing its due time with elapsed real time since playback started.

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8. Apparatus for displaying image data, comprising:

(a) image data comprising a plurality of image frames, sequences of said frames being organised into clips, each clip having a frame rate, and each frame in a clip thereby having a due time for display with respect to a start time for playing the clip;

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(b) display means;

(c) memory means;

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(d) network connecting means for enabling transfer of image data over a network from a frame source remotely connected to said network; and

(e) processing means configured to perform operations to play a clip from said frame source by:

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(i) selecting a next frame for preloading by skipping at least one frame in the clip's frame sequence;

(ii) preloading a frame from said frame source into a frame queue in said memory means;

- (iii) displaying a preloaded frame at its due time;
- (iv) processing elapsed real time since the clip started playing with a frame timing parameter; and
- (v) updating the number of frames to skip in response to said processing of elapsed real time.

9. Apparatus according to claim 8, wherein said frame timing parameter is the due time for a frame.

10. Apparatus according to claim 8, wherein instructions for the processing means are executed as multiple threads.

11. A method of displaying image data on an image viewing station, wherein:

(a) the image viewing station comprises display means, processing means, and network connecting means for transferring frames of said image data over a network from a remotely connected frame source;

(b) said image data comprises a plurality of image frames, and has a frame rate from which may be inferred a due time for display of each frame in a sequence of frames in said image data;

(c) said frame source returns a frame in response to a frame request issued over said network; and

(d) said processing means is configured to play a clip in which said method comprises:

(i) displaying selected frames from said frame source, on said display means, at their due time; and

(ii) skipping frames in said frame sequence in response to

an indication of the data transfer rate of said network.

5 12. A method according to claim 11, wherein said indication of the data transfer rate is provided by a comparison of the relative position of an input and an output pointer in a queue of frames that have been selected for display.

10 13. A method according to claim 11, wherein said frame source includes means for storing pre-rendered image frames.

15 14. A method according to claim 11, wherein said frames are skipped in response to a prediction of a network data transfer rate.

20 15. A method according to claim 11, wherein frames are prefetched into a frame queue prior to their due time.

25 16. A method according to claim 11, wherein a frame skip rate is defined by a user.

 17. A method according to claim 11, wherein a frame is selected for display by processing its due time with elapsed real time since playback started.

 18. A method for displaying image data on an image viewing station that comprises display means, processing means, memory means and network connecting means for enabling transfer of image data over a network from a frame source remotely connected to said network, wherein:

said image data comprises a plurality of image frames, sequences of said frames being organised into clips, each clip having a frame rate, and each frame in a clip thereby having a due time for display with respect to a start time for playing the clip;

5 said processing means is configured to perform operations to play a clip from said frame source by a method comprising:

(a) selecting a next frame for preloading by skipping at least one frame in the clip's frame sequence;

10 (b) preloading a frame from said frame source into a frame queue in said memory means;

(c) displaying a preloaded frame at its due time;

(d) processing elapsed real time since the clip started playing with a frame timing parameter; and

15 (e) updating the number of frames to skip in response to said processing of elapsed real time.

19. A method according to claim **18**, wherein said frame timing parameter is the due time for a frame.

20 **20.** A method according to claim **18**, wherein instructions for the processing means are executed as multiple threads.

21. A data structure upon a machine readable medium, comprising instructions for controlling an image viewing system to perform a method for
25 viewing image data, said viewing system comprising:

display means, processing means and network connecting means for transferring frames of said image data over a network from a remotely

connected frame source;

said image data comprising a plurality of image frames, and has a frame rate from which may be inferred a due time for display of each frame in a sequence of frames in said image data;

5 said frame source returns a frame in response to a frame request issued over said network; wherein

said processing means being configurable by said instructions to play a clip in which said method includes:

10 displaying selected frames from said frame source, on said display means, at their due time; and

 skipping frames in said frame sequence in response to an indication of the data transfer rate of said network.

22. A data structure according to claim **21**, wherein said indication
15 of the data transfer rate is provided by a comparison of the relative position of an input and an output pointer in a queue of frames that have been selected for display.

23. A data structure according to claim **21**, wherein said frame
20 source includes means for storing pre-rendered image frames.

24. A data structure according to claim **21**, wherein said frames are skipped in response to a prediction of a network data transfer rate.

25 25. A data structure according to claim **21**, wherein frames are prefetched into a frame queue prior to their due time.

26. A data structure according to claim 21, wherein a frame skip rate is defined by a user.

27. A data structure according to claim 21, wherein a frame is
5 selected for display by processing its due time with elapsed real time since playback started.

28. A data structure upon a machine readable medium, comprising instructions for controlling an image viewing system to perform a method for
10 viewing image data, said viewing system comprising:

display means, processing means, memory means and network connecting means for enabling transfer of image data over a network from a frame source remotely connected to said network, in which:

said image data comprises a plurality of image frames, sequences of
15 said frames being organised into clips, each clip having a frame rate, and each frame in a clip thereby having a due time for display with respect to a start time for playing the clip; wherein

said processing means is configured to perform operations to play a clip from said frame source by a method comprising:

20 (a) selecting a next frame for preloading by skipping at least one frame in the clip's frame sequence;

(b) preloading a frame from said frame source into a frame queue in said memory means;

(c) displaying a preloaded frame at its due time;

25 (d) processing elapsed real time since the clip started playing with a frame timing parameter; and

(e) updating the number of frames to skip in response to said

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- 29.** A data structure according to claim **28**, wherein said frame timing parameter is the due time for a frame.
- 30.** A data structure according to claim **28**, wherein instructions for steps (a) to (e) will be executed as multiple threads.